



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

The Complexities of Engineering Human Stem Cell-Derived Therapeutics

Citation for published version:

Hay, DC, Ross, JA, Gallagher, R & Bagnaninchi, P 2010, 'The Complexities of Engineering Human Stem Cell-Derived Therapeutics', *Journal of Biomedicine and Biotechnology*, vol. 2010, 654964, pp. -. <https://doi.org/10.1155/2010/654964>

Digital Object Identifier (DOI):

[10.1155/2010/654964](https://doi.org/10.1155/2010/654964)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Journal of Biomedicine and Biotechnology

Publisher Rights Statement:

Copyright © 2010 David C. Hay et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Editorial

The Complexities of Engineering Human Stem Cell-Derived Therapeutics

David C. Hay, James A. Ross, Ronnie Gallagher, and Pierre Bagnaninchi

MRC Centre for Regenerative Medicine, University of Edinburgh, Chancellor's Building, Edinburgh EH16 4SB, UK

Correspondence should be addressed to David C. Hay, davehay@talktalk.net

Received 31 December 2010; Accepted 31 December 2010

Copyright © 2010 David C. Hay et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

The aim of this special issue is to provide the scientific audience with an up-to-date review of pluripotent and tissue-specific stem cells and their differentiation in combination with cellular engineering in the quest to develop novel regenerative therapies.

The field of regenerative medicine is focused on the creation of functional tissue units to either repair or replace compromised tissue or organs *in vivo*. The field therefore offers the promise that, in the future, scientists will be able to grow tissues in the laboratory and use them safely as extracorporeal devices to stimulate endogenous repair [1] or implant them when the body cannot heal itself, but only when cell-based therapies are deemed safe and effective [2, 3]. If successful, such an approach would have a significant impact on the problem of the shortage of donor organs available for transplantation.

The collections of papers that make up this special issue provide broad-ranging coverage of the field and provide comprehensive and up-to-date reviews of human development and the relationships that exist between development, regeneration, carcinogenesis, and the role of stem cells in these processes (Kung et al., 2010). There is a focus on application of this knowledge using human embryonic stem cells which have the potential to provide novel biological models and medical devices (Sharma et al., 2010). Additionally, we discuss adult stem cell populations exploring their *in vitro* expansion (Wells, 2010) and plasticity (Lui et al., 2010), essential to regenerative medicine and tissue engineering. This is supported by the review article on generating the correct cell-cell and cell-environment interactions in these processes (Titushkin et al., 2010).

The ability to prepare homogeneous preparations of somatic cells for regenerative medicine will necessitate the

development of methods which are simple and do not expose derivative cell populations to greater stress. A highly attractive procedure, dielectrophoresis, shows great potential in population enrichment and in stem cell sorting and is discussed in this special issue (Pethig et al., 2010). It is likely that technologies which do not require cell surface labels will play an increasing role in regenerative medicine.

Stem cell-based therapies have been used successfully in the past, and many more are predicted for the future, therefore, it is critical that we produce cell types which are stable and contribute to tissue homeostasis *in vivo*. A crucial element of tissue homeostasis and organ stability is DNA repair. This process protects stem cells in both embryonic and adult tissues from genetic damage thereby maintaining a stable genome. DNA repair is a fast and efficient process, but it can prove problematic when stem cells undergo malignant transformation (Frosina et al., 2010). In order to gain a better understanding of this process noninvasive cellular techniques have been developed to accurately determine differences in normal and transformed cell lines. Raman spectroscopy is one such example and has provided insight into changes in DNA and RNA concentrations during the lifecycle of a cell, and, as such, we have highlighted this technique as a promising approach in this issue (Downes et al., 2010).

We hope that this collection of papers stimulates interest within the academic community and provides a basic and up-to-date overview of key areas in regenerative medicine, cell biology, and tissue engineering.

Acknowledgments

We would like to thank the authors for providing good-quality articles and hope that you, the readers, enjoy this

collection of papers. David C. Hay and Pierre Bagnaninchi were supported by RCUK Fellowships.

David C. Hay
James A. Ross
Ronnie Gallagher
Pierre Bagnaninchi

References

- [1] D. C. Hay, S. Pernagallo, J. J. Diaz-Mochon et al., “Unbiased screening of polymer libraries to define novel substrates for functional hepatocytes with inducible drug metabolism,” *Stem Cell Research*, vol. 6, no. 2, pp. 92–102, 2011.
- [2] C. M. Payne, K. Samuel, A. Pryde et al., “Persistence of functional hepatocyte-like cells in immune-compromised mice,” *Liver International*, vol. 31, no. 2, pp. 254–262, 2011.
- [3] D. C. Hay, “Cadaveric hepatocytes repopulate diseased livers: life after death,” *Gastroenterology*, vol. 139, no. 3, pp. 729–731, 2010.